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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Colin D. Frank

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EXAMINER

WARE, CICELY Q

ART UNIT

PAPER NUMBER

2634

DATE MAILED: 02/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/801,892

Applicant(s)

FRANK, COLIN D.

Examiner

Cicely Ware

Art Unit

2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on amendment filed on 10/28/2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-7, 10-13, 15-17 and 23 is/are rejected.
- 7) ☒ Claim(s) 4, 8, 9 and 18-22 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 October 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see **REMARKS**, filed 10/28/2004 with respect to the rejection(s) of claim(s) 1-7, 10-17 and 23 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Paulraj et al. (US Patent 6,351,499) and Rashid-Farrokhi et al. (US Patent 6,304,750).

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-3, 5, 6, 11-13, 15, 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Paulraj et al. (US Patent 6,321,499).

(1) With regard to claim 1, Paulraj et al. discloses in (Fig. 3) a method for antenna beamforming in a communication system comprising a plurality of subscriber units and a transmitting communication device (50) having an antenna array (74) comprised of a plurality of array elements, the method comprising a step of jointly

optimizing a plurality of weighting coefficients (72) to produce a plurality of optimized weighting coefficients for use by the transmitting communication device in transmissions to the plurality of subscriber units, wherein each optimized weighting coefficient of the plurality of optimized weighting coefficients is associated with an element of the plurality of elements and is further associated with a subscriber unit of the plurality of subscriber units (col. 2, lines 25-33, 55-57, col. 6, lines 11-14, col. 8, lines 25-33, 40-67, col. 9, lines 40-50).

(2) With regard to claim 2, claim 2 inherits all the limitations of claim 1. Paulraj et al. further discloses in (Fig. 3 (68, 66, 72, 74)) modulating a plurality of signals to produce a plurality of modulated signals, wherein each signal of the plurality of signals is modulated based on an optimized weighting coefficient of the plurality of optimized weighting coefficients; transmitting each modulated signal of the plurality of modulated signals via an array element of the plurality of array elements (col. 7, lines 19-31, 45-48, 57-63, col. 8, lines 40-67).

(3) With regard to claim 3, claim 3 inherits all the limitations of claim 1. Paulraj et al. further discloses wherein the step of jointly optimizing a plurality of weighting coefficients comprises a step of determining values for the plurality of weighting coefficients that jointly maximize a signal-to-noise ratio for each subscriber unit of the plurality of subscriber units (col. 7, lines 62-67, col. 8, lines 1-31).

(4) With regard to claim 5, claim 5 inherits all the limitations of claim 1. Paulraj et al. further discloses approximating one or more terms in a joint optimization expression of a signal-to-noise ratio (SNR) to produce an approximation of the joint optimization

expression of an SNR; and independently optimizing a set of weighting coefficients of a plurality of sets of weighting coefficients based on the approximation of the joint optimization expression of an SNR to produce a set of optimized weighting coefficients, wherein each set of optimized weighting coefficients of the plurality of sets of optimized weighting coefficients corresponds to a subscriber unit of the plurality of subscriber units (col. 8, lines 1-15, 22-33, col. 11, lines 30-44).

(5) With regard to claim 6, claim 6 inherits all the limitations of claim 2. Paurej et al. further discloses in (Fig. 3 (72, 74)) wherein each optimized weighting coefficient in a set of optimized weighting coefficients corresponds to an array element of the plurality of array elements (col. 8, lines 35-67).

(6) With regard to claim 11, claim 11 inherits all the limitations of claim 1. Paulraj et al. further discloses in (Fig. 1) a communication system (24) comprising a plurality of subscriber units, a communication device (Fig. 3 (50)) comprising: an antenna array (Fig. 3 (74)) comprising a plurality of array elements; a plurality of weighters (72), wherein each weighter of the plurality of weighters is coupled to an element of the plurality of elements; and a processor (60, 68) coupled to each weighter of the plurality of weighters (col. 8, lines 35-67).

(7) With regard to claim 12, claim 12 inherits all the limitations of claim 11. Paulraj et al. further discloses in (Fig. 3 (50)) the communication device transmits data to a subscriber unit of the plurality of subscriber units, the processor (60, 68) provides to each weighter of the plurality of weighters the weighting coefficient associated with the subscriber unit and with the element coupled to the weighter and wherein each weighter

(72) then modulates a signal based on the weighting coefficient received from the processor (col. 7, lines 19-31, 45-48, 57-64, col. 8, lines 35-67)

(8) With regard to claim 13, claim 13 inherits all the limitations of claims 11. Paulraj et al. further discloses wherein the processor jointly optimizes a plurality of weighting coefficients by determining values for the plurality of weighting coefficients that jointly maximize a signal-to-noise ratio for each subscriber unit (col. 8, lines 1-34, 41-67)

(9) With regard to claim 15, claim 15 inherits all the limitations of claims 11 and 5.

(10) With regard to claim 16, claim 16 inherits all the limitations of claim 12. Paulraj et al. further discloses wherein each optimized weighting coefficient in a set of optimized weighting coefficients corresponds to an array element of the plurality of array elements (col. 8, lines 35-67).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 7, 10, 17 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paulraj et al. (US Patent 6,321,499) as applied to claims 5 and 15, in view of Rashid-Farrokhhi et al. (US Patent 6,304,750).

(1) With regard to claim 7, claim 7 inherits all the limitations of claim 5. However Paulraj et al. does not disclose wherein each subscriber unit of the plurality of subscriber units comprises a Rake receiver, wherein a covariance of an output of the Rake receiver of each subscriber unit comprises a contribution to the covariance by the other subscriber units of the plurality of subscriber units, wherein the step of approximating one of more terms in a joint optimization expression of an SNR comprises a step of approximating the covariance of an output of the Rake receiver of each subscriber unit with a contribution of the covariance by the other subscriber units.

However Rashid-Farrokhi et al. discloses wherein each subscriber unit of the plurality of subscriber units comprises a Rake receiver, wherein a covariance of an output of the Rake receiver of each subscriber unit comprises a contribution to the covariance by the other subscriber units of the plurality of subscriber units, wherein the step of approximating one of more terms in a joint optimization expression of an SNR comprises a step of approximating the covariance of an output of the Rake receiver of each subscriber unit with a contribution of the covariance by the other subscriber units (abstract, col. 1, lines 11-19, col. 4, lines 23-25).

Therefore it would have been obvious to one of ordinary skill in the art to modify Paulraj et al. in view of Rashid-Farrokhi et al. to incorporate wherein each subscriber unit of the plurality of subscriber units comprises a Rake receiver, wherein a covariance of an output of the Rake receiver of each subscriber unit comprises a contribution to the covariance by the other subscriber units of the plurality of subscriber units, wherein the step of approximating one of more terms in a joint optimization expression of an SNR

comprises a step of approximating the covariance of an output of the Rake receiver of each subscriber unit with a contribution of the covariance by the other subscriber units to extract the training sequence as affected by the channel and in order for no bits of the frame to be wasted on the training sequence and additional system capacity can be achieved (Rashid-Farrokhi et al., col. 4, lines 25-34).

(2) With regard to claim 10, claim 10 inherits all the limitations of claim 7. Paulraj et al. further discloses in (Fig. 1 and 2) wherein the communication system further comprises a plurality of communication channels, wherein each communication channel of the plurality of communication channels is allocated to a subscriber unit of the plurality of subscriber units wherein a power allocated by the transmitting communication device to each communication channel is a reasonable small fraction of the total power transmitted by the communication device in order to permit the system to continuously optimize desirable parameters while the channel varies (col. 8, lines 1-21, 34-39).

(3) With regard to claim 17, claim 17 inherits all the limitations of claims 15 and 7.

(4) With regard to claim 23, claim 23 inherits all the limitations of claims 15 and 10.

Allowable Subject Matter

6. Claims 4, 8, 9, 14 and 18-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of

reasons for the indication of allowable subject matter: The instant application discloses a method for antenna beamforming is a communication system. Prior art references show similar methods but fail to teach: **“the step of jointly optimizing a plurality of weighting coefficients comprises a step of jointly optimizing a plurality of weighting coefficients based on information concerning a plurality of propagation channels and an autocorrelation of background interference and wherein each propagation channel of the plurality of propagation channels is a propagation channel between a subscriber unit of the plurality of subscriber units and an array element of the plurality of array elements”, as in claims 4 and 14; “wherein the transmitting communication device operates in an environment where inter-cell interference dominates intra-cell interference, wherein the step of approximating one or more terms in a joint optimization expression of an SNR comprises a step of assuming that the ratio of intra-cell interference to inter-cell interference is equal to zero”, as in claims 8 and 21; “wherein the transmitting communication device operates in an environment where intra-cell interference dominates inter-cell interference, wherein the step of approximating one or more terms in a joint optimization expression of an SNR comprises a step of assuming that the ratio of intra-cell interference to inter-cell interference approaches infinity”, as in claims 9 and 22; “wherein the approximation of the contribution to the covariance by the other subscriber units comprises the equation”, as in claim 18; “wherein the approximation of the contribution to the covariance by the other subscriber units comprises the equation”, as in claim 19”; “wherein the**

approximation of the contribution to the covariance by the other subscriber units comprises the equation", as in claim 20.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cicely Ware whose telephone number is 703-305-8326. The examiner can normally be reached on Monday – Friday, 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 703-305-4714. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

Cicely Ware
cqw
February 7, 2005



AMANDAT LE
PRIMARY EXAMINER